Course-Chemistry

Standard: 1, Objective 3

Title: Primo Levi and the Periodic Table

Description: Hand out the slightly edited excerpt of the chapter "Potassium" to the students. In this text, Levi describes an accident in a laboratory in which he was involved as an undergraduate student. Levi had to distill benzene in the presence of sodium; however, since he was unable to find this metal in his laboratory, he decided to replace the sodium with potassium. After the distillation, Levi took the flask to the sink to wash it. As the water entered the flask, an explosion occurred, and a fire started in the laboratory. Levi was able to extinguish the fire without any serious consequences. He then tried to find an explanation for the incident.

Materials Needed: Primo Levi Article, computers or dictionaries

Time Needed: 45 min.

Safety issues or specialized background knowledge:

Teacher Procedures:

Hook activity:

- 1. Ask students to describe in a pair/share activity, an accident/mistake that they made when they made an assumption about a substance or chemical. Give an example from your experience.
- 2. Ask a few students to share their experiences.

Reading activity.

- 1. Read the introduction to the students and discuss.
- 2. Have the students read the article & summarize it, then answer the questions.
- 3. In groups of 3-4 students have them read the sentences from the text, and come to a conclusion about the questions as a group.

Primo Levi and The Periodic Table: Teaching Chemistry Using a Literary Text

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Students received part of the chapter "Potassium" of Primo Levi's book *The Periodic Table (1)*. The adapted excerpt follows:

Now I had to distill [benzene] a second time in the presence of sodium. Sodium is a degenerated metal: it is indeed a metal only in the chemical significance of the word, certainly not in that of everyday language. It is neither rigid nor elastic; rather it is soft like wax; it is not shiny or, better, it is shiny only if preserved with maniacal care, since otherwise it reacts in a few instants with air, covering itself with an ugly rough rind: with even greater rapidity it reacts with water, in which it floats (a metal that floats!), dancing frenetically and developing hydrogen. I ransacked the entrails of the Institute in vain:...I found dozens of labeled ampoules,...but not a sign of sodium. Instead I found a small phial of potassium: potassium is sodium's twin, so I grabbed it and returned to my hermitage.

I put in the flask of benzene a lump of potassium, "as large as half a pea"—so said the manual—and diligently distilled the contents: toward the end of the operation I dutifully doused the flame, took apart the apparatus, let the small amount of liquid in the flask cool off a bit, and then with a long pointed stick skewered the "half pea" of potassium and lifted it out.

Potassium, as I said, is sodium's twin, but it reacts with air and water with even greater energy: it is known (and was known also to me) that in contact with water it not only develops hydrogen but also ignites. So I handled my "half pea" like a holy relic: I placed it on a piece of dry filter paper, wrapped it up in it, went down into the Institute's courtyard, dug out a tiny grave, and buried the little bedeviled corpse. I carefully tamped down the earth above it and went back up to my work.

I took the now empty flask, put it under a faucet, and turned on the water. I heard a rapid thump and from the neck of the flask came a flash of flame directed at the window that was next to the washbasin and the curtains around it caught fire. While I was stumbling around looking for some even primitive means to extinguish it, the panels of the shutter began to blister and the room was now full of smoke. I managed to push over a chair and tear down the curtains; I threw them on the floor and stomped furiously on them...[extinguishing the fire].

[I] returned to the scene of the accident, and found fragments of the flask still on the floor: on one of them, by looking closely, one could see, barely visible, a tiny white fleck. I tested it with phenolphthalein: it was basic, it was potassium hydroxide. The guilty party had been found: adhering to the glass of the flask there must have remained a minuscule particle of potassium, all that was needed to react with the water I had poured in and set fire to the benzene vapors.

The assistant looked at me with an amused, vaguely ironic expression: better not to do than to do...I thought of another moral, more down to earth and concrete, and I believe that every militant chemist can confirm it: that one must distrust the almost-the-same (sodium is almost the same as potassium, but with sodium nothing would have happened), the practically identical, the approximate, the or-even, all surrogates, and all patchwork. The differences can be small, but they can lead to radically different consequences, like a railroad's switch points; the chemist's trade consists in good part in being aware of these differences, knowing them close up, and foreseeing their effects. And not only the chemist's trade. (Levi, Primo. *The Periodic Table*, Raymond Rosenthal transl.; Schocken Books: New York, 1984.)

Name	Date	Per
Title: Primo Levi and the Periodic Table		
writer. Levi was born in Turin, Italy, into a middled the first in his class at the University of Turin—in some He worked in a pharmaceutical laboratory until 19 a group of resistors. Arrested by the German arm Auschwitz. He survived because he was sent to wo fithe camp. Levi died in 1987, after falling down since his return at the end of the war. In most of before to a little after World War II. Each one of	e autobiographical books written by Primo Levi (19 class family of assimilated, nonreligious Jews. In 19 spite of Fascist Italy's racial law of 1938 that forbade 143, when—after Mussolini's fall and the invasion of my, Levi was eventually identified as a Jew and depoyork in an I. G. Farben laboratory, which produced sy the stairwell from the third floor of the house where of The Periodic Table, Levi narrates his memories of the twenty-one chapters of the book is named at a facts of his own life." (J. Chem. Educ. 2007, 84, 77)	941, he graduated in chemistry as a Jews access to higher education. Italy by German troops—he joined orted to the concentration camp at ynthetic rubber at the labor section he was born, and where he lived from a period ranging from a little fter a chemical element, and Levi
Procedures: 1. Read the article about potassium from Primo Le 2. Write a short summary of the article and answe 3. Work with your group to fill in the table.		
	um" from Primo Levi's book, <i>The Periodic Table.</i> It is mary in your own words. You can use the internet ar	
Summary:		

After you have completed the summary, answer the following questions.			
1.Why did the author suppose that he could use potassium instead of sodium?			
How do you think he got that idea?			
2. Do you think it is part of a chemist's work to make "innovations" like that, namely, to introduce changes in established procedures, likes changing potassium for sodium?			
3. Write your opinion on the following comment made by the author: "[T]he chemist's trade consists in good part in being aware of these differences [between almost-the same substances], knowing them close up, and foreseeing their effects."			

Analysis: Part B Group Discussion

Excerpts from the book	Group discussion questions	Group answers/conclusion
Now I had to distill [benzene] a second time in the presence of sodium.	A distillation separates one substance from another. Why would he do it twice? What might the sodium do?	
It [sodium] is not shiny or, better, it is shiny only if preserved with maniacal care, since otherwise it reacts in a few instants with air, covering itself with an ugly rough rind.	What reaction takes place? What are the products? How must sodium be stored?	
[Sodium] reacts with water, in which it floats (a metal that floats!).	Why does sodium float on water? What reaction takes place?	
[Potassium] is sodium's twin, but it reacts with air and water with even greater energy.	Why does the author consider potassium and sodium as "twins"? Why does potassium react with more energy than sodium? (Look at a periodic table)	
In contact with water it [potassium] not only develops hydrogen but also ignites.	Is it correct to say that potassium ignites?	
I placed it [the residue of potassium] on a piece of dry filter paper, wrapped it up in it, went down into the Institute's courtyard, dug out a tiny grave, and buried the little bedeviled corpse.	What is the proper way to dispose of an excess of potassium?	
Adhering to the glass of the flask there must have remained a minuscule particle of potassium, all that was needed to react with the water I had poured in and set fire to the benzene vapors.	Why did a fire begin in the flask? What was the immediate cause of this fire?	
By looking closely, one could see, barely visible, a tiny white fleck. I tested it with phenolphthalein: it was basic, it was potassium hydroxide. The guilty party had been found	What is the nature of potassium hydroxide? In the episode described, was the potassium hydroxide formed only during the cleaning of the flask?	
Sodium is almost the same as potassium, but with sodium nothing would have happened.	Is it correct to say that with sodium nothing would have happened?	

Conclusion: